

1. it does not form an ideal solution ✓ Quarterly test #2

2. I expect the solubility to decrease ✓

3. • The solute-solute attractions are greater than the solute-solvent attractions. ✓

• The sign of ΔS is positive ✓

4. you will see the laser beam when it goes through the colloid. ✓

5.
$$\left(\frac{0.750 \text{ moles of CaCl}_2}{1} \right) \left(\frac{111.1 \text{ g CaCl}_2}{1 \text{ mole of CaCl}_2} \right) = 83.3 \text{ g of CaCl}_2$$

$$\text{total mass} = 83.3 \text{ g} + 1.0 \times 10^3 = 1.08 \times 10^3 \text{ g} \quad \checkmark$$

$$\left(\frac{1.08 \times 10^3 \text{ g}}{1} \right) \left(\frac{1 \text{ mL}}{1.15 \text{ g}} \right) = 939 \text{ mL} = 0.939 \text{ L} \quad \checkmark$$

$$\text{molarity} = \frac{0.750 \text{ moles of Mg(OH)}_2}{0.939 \text{ L}} = \boxed{0.799 \text{ M}} \quad \checkmark$$

6. The Triple Point temperature will decrease ✓

7.
$$\left(\frac{1.00 \times 10^3 \text{ g of water}}{1} \right) \left(\frac{1 \text{ mole of water}}{18.0 \text{ g of water}} \right) = 55.6 \text{ moles of water} \quad \checkmark$$

$$\text{mole fraction} = \frac{1.50 \text{ moles of NaCl}}{55.6 \text{ moles of water} + 1.50 \text{ moles of NaCl}}$$

$$= 0.0263 \quad \checkmark$$

$$\frac{45}{45} \quad 100\%$$

8. • The equilibrium constant is extremely big. ✓
 • Not an equilibrium but a complete reaction ✓

9. MgCl_2 will be more soluble in MnF_2 ✓

10.

$$\Delta G = - (R)(T)(\ln(K))$$

$$= - (8.314)(298)(\ln(12.1))$$

$$= -6.18 \times 10^3 \text{ J/moles} \quad \checkmark$$



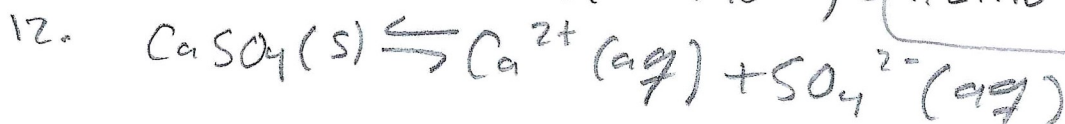
$$1.0 \times 10^{-25} = (3x)^3 (2x)^2$$

$$1.0 \times 10^{-25} = 27x^3 (4x^2)$$

$$\frac{1.0 \times 10^{-25}}{108} = \frac{108x^5}{108} \quad \sqrt{x^5} = \sqrt{9.26 \times 10^{-28}}$$

$$x = 3.9 \times 10^{-6} \quad \checkmark$$

$$3(3.9 \times 10^{-6}) = 1.2 \times 10^{-5} \text{ M} \quad \checkmark$$



$$K_{sp} = x(0.75)$$

$$2.4 \times 10^{-5} = x(0.75)$$

$$\frac{2.4 \times 10^{-5}}{0.75} = \frac{0.75x}{0.75} \quad \checkmark$$

$$x = 3.2 \times 10^{-5} = [\text{Ca}^{2+}] \quad \checkmark$$

13.



$$K_{sp} = [\text{Mg}^{2+}][\text{F}^-]^2$$

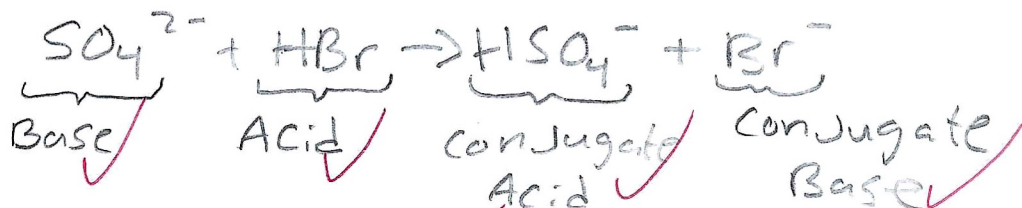
$$[\text{Mg}^{2+}] = 0.0075 \text{ M} \quad \checkmark$$

$$[\text{F}^-] = 0.00050 \text{ M} \quad \checkmark$$

$$K_{sp} = (0.0075)(0.00050)^2 = 1.9 \times 10^{-9} \quad \checkmark$$

A precipitate will not form \checkmark

14.



15.



$$\left(\frac{0.140 \text{ moles of HCl}}{1 \text{ liter}} \right) \left(\frac{1 \text{ mole of H}_3\text{O}^+}{1 \text{ mole of HCl}} \right) = 0.140 \text{ M of H}_3\text{O}^+$$

$$\text{pH} = -\log(0.140)$$

$$\text{pH} = 0.854 \quad \checkmark$$

16. The base is NH_3 and the Acid is Ag^+ \checkmark

17.



$$K_a \text{ of } \text{H}_2\text{CO}_3 = 4.3 \times 10^{-7}$$

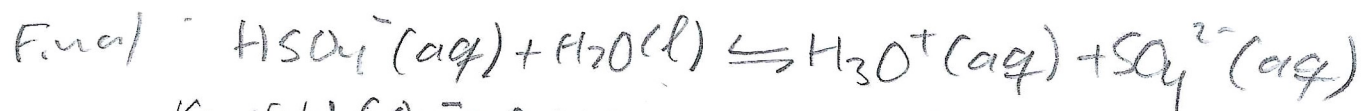
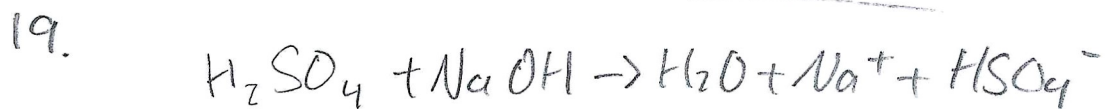
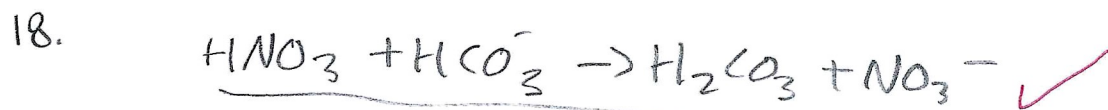
$$K_a \text{ of } \text{HCO}_3^- = 7 \times 10^{-11}$$

$$1.5 \cdot 4.3 \times 10^{-7} = \frac{x^2}{1.5} \quad \checkmark$$

$$\sqrt{6.45 \times 10^{-7}} = \sqrt{x^2}$$

$$x = 8.0 \times 10^{-4} \quad \checkmark$$

$$\text{pH} = -\log(8.0 \times 10^{-4}) = 3.10 \quad \checkmark$$



$K_a \text{ of } \text{HSO}_4^- = 0.012$

$(0.35 - x) \cdot 0.012 = \frac{x(0.70 + x)}{0.35 - x}$ ✓

$\frac{-0.012x + 0.0042}{+0.012x - 0.0042} = \frac{(0.35 - x)}{0.70x + x^2}$

$0 = x^2 + 0.712x - 0.0042$

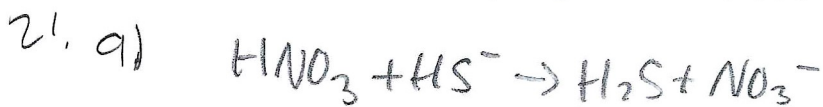
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-0.712 \pm \sqrt{(0.712)^2 - 4(1)(-0.0042)}}{2}$

$= \frac{-0.712 \pm \sqrt{0.507 + 0.0168}}{2} = \frac{-0.712 \pm \sqrt{0.523744}}{2}$

$= \frac{-0.712 \pm 0.724}{2} = 0.012, \text{ or } -1.44$

$\text{pH} = -\log(0.012) = \boxed{1.9}$ ✓

20. b. A mixture of H_2CO_3 and NaHCO_3 will make a buffer ✓



22. $\text{Ba}(\text{OH})_2$ will be more soluble in $\text{pH} = 2$ solution ✓

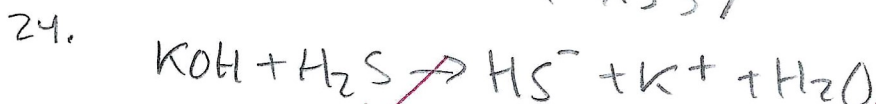
23.
$$\left(\frac{25.0 \text{ g of H}_2\text{S}}{1} \right) \left(\frac{1 \text{ mole of H}_2\text{S}}{34.1 \text{ g of H}_2\text{S}} \right) = 0.733 \text{ moles of H}_2\text{S}$$

$$\frac{0.733 \text{ moles of H}_2\text{S}}{0.1000 \text{ L}} = 7.33 \text{ M of H}_2\text{S} \quad \checkmark$$

$$\left(\frac{25.0 \text{ g of KHS}}{1} \right) \left(\frac{1 \text{ mole of KHS}}{72.2 \text{ g of KHS}} \right) = 0.346 \text{ moles of KHS}$$

$$\frac{0.346 \text{ moles of KHS}}{0.1000 \text{ L}} = 3.46 \text{ M of KHS} \quad \checkmark$$

$$\text{pH} = 7 + \log\left(\frac{3.46}{7.33}\right) = 7 - 0.36 = 6.67 \quad \checkmark$$



$$\left(\frac{5.0 \text{ g of KOH}}{1} \right) \left(\frac{1 \text{ mole of KOH}}{56.1 \text{ g of KOH}} \right) = 0.089 \text{ moles of KOH} \quad \checkmark$$

$$\text{pH} = 7 + \log\left(\frac{4.35}{6.44}\right) = 7 - 0.170 = 6.83 \quad \checkmark$$



$$K_P = 0.57$$

$$0.57 = \frac{(2x)^2 (3x)^3}{1.0 (1.0)^2} \quad \checkmark$$

$$0.57 = \frac{108x^5}{1}$$

$$\frac{0.57}{108} = \frac{108x^5}{108}$$

$$0.00528 = x^5$$

$$x = 0.35$$

→

$$0.57 = \frac{108x^5}{(1.0 - 0.35)(1.0 - 2(0.35))^2}$$

$$0.57 = \frac{108x^5}{0.65(0.09)}$$

$$0.57 = \frac{108x^5}{0.0585}$$

$$0.033345 = \frac{108x^5}{108}$$

$$\sqrt[5]{3.09 \times 10^{-4}} = \sqrt[5]{x^5}$$

$$x = 0.20$$

$$0.57 = \frac{108x^5}{(1 - 0.20)(1 - 2(0.20))^2}$$

$$0.57 = \frac{108x^5}{0.8(0.36)}$$

$$0.57 = \frac{108x^5}{0.288}$$

$$0.16416 = 108x^5$$

$$0.00152 = x^5$$

$$x = 0.27$$

$$0.57 = \frac{108x^5}{(1 - 0.27)(1 - 2(0.27))^2}$$

$$0.57 = \frac{108x^5}{0.73(0.216)}$$

$$0.57 = \frac{108x^5}{0.154468}$$

$$0.08809676 = 108x^5$$

$$x = 0.24$$

$$0.57 = \frac{108x^5}{(1 - 0.24)(1 - 2(0.24))^2}$$

$$0.57 = \frac{108x^5}{0.76(0.2704)}$$

$$0.57 = \frac{108x^5}{0.205504}$$

$$x = 0.26$$

$$0.57 = \frac{108x^5}{(1 - 0.26)(1 - 2(0.26))^2}$$

$$0.57 = \frac{108x^5}{0.74(0.2304)}$$

$$0.57 = \frac{108x^5}{0.170496}$$

$$x = 0.25 \checkmark$$

$$0.57 = \frac{108x^5}{(1 - 0.25)(1 - 2(0.25))^2}$$

$$0.57 = \frac{108x^5}{0.75(0.25)}$$

$$0.57 = \frac{108x^5}{0.1875}$$

$$x = 0.25 \checkmark$$

$$x = 0.25$$

$$z = 2x$$

$$z = 2(0.25) = 0.50 \text{ atm} \checkmark$$